

REMARKS

In the Specification

Applicants have amended the specification at page 4 to correct an inadvertent and obvious typographical error in the definition of "heteroalkyl." The heteroalkyl definition originally stated that one or more *hydrogen atoms* (emphasis added) attached to any carbon of the alkyl is replaced by a heteroatom. One of skill in the art would readily recognize that replacing a hydrogen atom in an alkyl group would not produce a heteroalkyl. Applicants have corrected this error by amending the heteroalkyl definition to recite that one or more *carbon* atoms of the alkyl is replaced by a heteroatom. This amendment does not constitute new matter.

In the Claims

Claims 10, 14, and 15 are pending in the current application. Applicants have amended claim 10 to more particularly point out and distinctly claim the invention.

Applicants have cancelled claim 15 without prejudice.

The amendments do not constitute new matter.

The Rejections under 35 U.S.C. § 102(a)

The Examiner has rejected claims 10, 14, and 15 under 35 U.S.C. § 102(a) as allegedly being anticipated by JP 11-199592 to Matsui et al (hereinafter "Matsui"). In light of the claim amendments, applicants traverse.

Claim 15 has been cancelled by applicants. Claim 10 has been amended to delete silyl, heteroalkyl, and substituted heteroalkyl from the definitions of radicals R¹ and R². Claim 14 depends from claim 10 and thus, incorporates the amended definitions of claim 10. With this amendment, none of the compounds specifically disclosed in Matsui fall within the scope of claim 10 or claim 14. Therefore, Matsui fails to anticipate the presently claimed invention. Accordingly, applicants request that the Examiner withdraw this rejection.

The Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected claims 10, 14, and 15 under 35 U.S.C. § 103(a) as allegedly being unpatentable over WO 99/01460 to Murray (hereinafter "Murray").

Specifically, the Examiner alleges that "Murray teaches complexes described generically in claims 10 and 14" and particularly "the third organometallic complex shown in claim 2" of Murray. (Office Action, paragraph 4). The Examiner concedes that Murray does not show specifically an organometallic complex containing hafnium, but alleges that arriving at such a complex would be obvious to one of ordinary skill in the art because "Murray indicates that metal M includes group 3-13 elements, which would include the group 4 metal hafnium." The Examiner further alleges that "this would be especially obvious because the claims in Murray show zirconium complexes, with zirconium also being a group 4 metal."

Applicants disagree that the instant claims are obvious in view of Murray. A prima facie case of obviousness can be rebutted by evidence that the claimed invention provides unexpectedly improved properties. (See MPEP 2144.08(II)(B).)

Applicants' hafnium catalyst compositions and complexes catalyze polymerization reactions surprisingly more efficiently and selectively than known zirconium systems. For example, applicants have provided data in the specification showing that the catalytic performance of the hafnium precursor $\text{Hf}(\text{CH}_2\text{C}_6\text{H}_5)_4$ is very low, as indicated by the 47 mg yield of copolymer obtained per mole of metal complex. (See Table 2 at specification page 37). However, when the hafnium precursor is combined with ancillary ligand 4, 5 or 6 of the present invention, the yields of copolymer are dramatically enhanced (442 mg, 482 mg, and 411, respectively). This result is surprising and unexpected, especially in view of applicants' data for the corresponding zirconium catalysts. As shown in Table 3, the yield of copolymer obtained is the highest when the zirconium precursor $\text{Zr}(\text{CH}_2\text{C}_6\text{H}_5)_4$ is used alone than when that zirconium precursor is used with ancillary ligands 4, 5 or 6 (369 mg compared to 270-279 mg). Applicants' surprising and unexpected results illustrate the ability of ancillary ligands of the present invention to enhance catalytic performance of the hafnium metal center. Such results could not be predicted by Murray because Murray does not teach or suggest that substituting hafnium for zirconium would lead to an enhancement in catalytic performance.

In addition, applicants' hafnium-containing complexes produce copolymers having a higher copolymer incorporation than the corresponding zirconium-containing complexes. As shown in Tables 2 and 3, each of the ethylene/1-octene copolymers obtained from the combination of ancillary ligands 4, 5 and 6 with the zirconium precursor possess a lower weight percentage of 1-octene values (<10 wt. %) than the combination of those ancillary ligands with the hafnium precursor (>10 wt. %). Further, applicants' complexes produce copolymers having a wider range of 1-octene incorporation (10-20 wt. %) as

compared to zirconium containing complexes (6-7 wt. %). These surprising and unexpected results illustrate the ability of applicants' hafnium containing complexes to tailor the amount of incorporation of 1-octene into the copolymer. Such results could not be predicted by Murray's teaching of zirconium-containing catalysts.

In summary, applicants' hafnium-containing complexes provide markedly better catalytic yields and co-monomer incorporation than zirconium-containing complexes. One of skill in the art, having read Murray, would not have anticipated such an enhancement in catalytic performance. Accordingly, Murray does not render any claim of the present invention obvious. Applicants therefore request that the Examiner withdraw this rejection.

Conclusion

Applicants request that the Examiner consider the forgoing amendments and remarks, withdraw the rejections and allow the pending claims. To expedite prosecution, the Examiner is invited to telephone the undersigned to discuss any matter that may be resolved over the telephone.

Respectfully submitted,



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